

What is claimed is:

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1. A vesicle comprising a semi-permeable, thin-walled encapsulating membrane, wherein the membrane is formed in an aqueous solution, and wherein the membrane comprises one or more synthetic super-amphiphilic molecules.
  2. A polymersome.
  3. The vesicle of claim 1, wherein at least one super-amphiphile molecule is a block copolymer and wherein the resulting vesicle is termed a polymersome.
  4. The polymersome of claim 3, comprising a diblock copolymer.
  5. The polymersome of claim 3, comprising a triblock copolymer.
  6. The polymersome of claim 3, wherein all of the super-amphiphile molecules are block copolymers.
  7. The polymersome of claim 3, wherein the vesicle is prepared together with one or more small amphiphiles.
  8. The polymersome of claim 7, wherein at least one small amphiphile is a phospholipid.
  9. The polymersome of claim 3, wherein the vesicle self-assembles in aqueous solution.
  10. The polymersome of claim 3, wherein at least one block copolymer is selected from the group consisting of polyethylene oxide (PEO), poly(ethylene) (PEE), poly(butadiene) (PB), poly(styrene) (PS) and poly(isoprene) (PI).
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11. The polymersome of ~~claim 1~~, wherein the copolymers are cross-linked.

12. The polymersome of ~~claim 1~~, wherein the integrity of the membrane is maintained when the polymersome is exposed to an organic solvent or boiling water, and when the polymersome is dehydrated in air or rehydrated in an aqueous solution.

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A1 } 13. The polymersome of claim 3, wherein the vesicle is biocompatible.

14. The polymersome of claim 3, wherein the polymersome encapsulates at least one composition selected from the group consisting of a drug, therapeutic compound, dye, nutrient, sugar, vitamin, protein or protein fragment, salt, electrolyte, gene or gene fragment, product of genetic engineering, steroid, adjuvant, biosealant, gas, ferrofluid, and liquid crystal.

15. The method of using the polymersome of claim 3 to transport an encapsulatable material to or from the environment immediately surrounding the polymersome.

16. The method of using the polymersome of claim 13 to transport to or from a patient a composition consisting of a drug, therapeutic composition, dye, nutrient, sugar, vitamin, protein or protein fragment, salt, electrolyte, gene or gene fragment, product of genetic engineering, steroid, adjuvant, biosealant and gas to a patient in need of such composition.

17. The method of preparing the polymersome of claim 3, comprising at least one step consisting of a film rehydrating step, a bulk rehydrating step, or an electroforming step.

18. A method of controlling the release of an encapsulated material from a polymersome of claim 3 by modulating the composition of the membrane.

19. A method of controlling the release of an encapsulated material from a polymersome of claim 18 by cross-linking a membrane comprising at least one cross-linkable amphiphile and at least one non cross-linkable molecule, and subjecting the thus destabilized membrane to chemical exposure or propagated light, sound, heat, or motion.

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20. An encapsulating membrane comprising a semi-permeable, thin-walled encapsulating, amphiphilic membrane, wherein the membrane is formed around a droplet of oil in a microemulsion of oil dispersed in an aqueous solution, and wherein the membrane comprises one or more synthetic super-amphiphilic molecules.

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